Twitter, Thought Speed, and What Happens When Your Phone Goes Back in Your Pocket

Honors Undergraduate Thesis

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Abstract

Social media applications have become nearly ubiquitous in the past decade. As research into their effects on well-being, along with mobile phones, has caught up with adoption researchers have uncovered multiple negative effects. Why do people spend so much time on social media if it leads to lower feelings of happiness and connection? We suggest that at least part of social media's appeal stems from a relationship with thought speed. We focus our analysis on one key aspect of social media usage, which is that it allows users to choose the speed at which they absorb content as they scroll as fast as desired. Participants in our study observed the same twitter feed either at their own pace or a fixed, slow pace. Being able to control the rate at which you take in information does increase thought speed. This ability to control information intake also increases people's cognitive performance on the next activity they undertake.

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Introduction

Since Steve Jobs introduced the iPhone in 2007 smartphones have rapidly become more entwined with our daily lives and pervasively used around the world (Elhai et al., 2017). Research literature measuring their impacts and those of their accompanying platforms has exploded with this adoption. According to Neilsen, Adults in the U.S. currently spend nearly 4 hours a day on computers, tablets, and smartphones. Twitter currently garners 126 million daily active users and Facebook, 1.2 billion; a testament to how social media has changed the way we interact as a society.

Much of the current behavioral research surrounding mobile phones has identified negative consequences that accompany their use. Many smartphone users experience mounting anxiety and physiological withdrawal symptoms when separated from their devices (Elhai et al., 2017). A University of Chicago study found that the presence of one's phone, even when not in use, reduces cognitive capacity and these costs are highly correlated to smartphone dependence (Bos et al., 2017). Social networking sites have also opened the door for multiple negative outcomes, exposing users to cyberbullying and online harassment, privacy concerns, and "Facebook depression (Okeefe & Clarke-Pearson, 2011)." As smartphones have transformed from not just 'technological objects' but 'social objects' they are having greater effects on the ways we think and act (Srivastava, 2010). Why have these technologies become so widespread with so many negative consequences? We explore if it could involve their relationship with thought speed here.

Increased thought speed is characterized by the feeling of one's mind racing after drinking a few too many cups of coffee, or learning about an intriguing new idea, while decreased thought speed can be envisioned as the struggle to turn one's mind over during a bout of writer's block or brush with depression (Pronin & Jacobs, 2008). This experiment sought to

understand social media’s effects on well-being through thought speed manipulation and it's known effects on mood and creativity. Thought speed has not been manipulated through social media to this point. We seek to expand upon these studies by studying thought speed's carry-over effects on experience enjoyment and cognitive performance through deliberative, and automatic thinking puzzles. Hopefully, these findings allow social media users to better understand how these platforms are affecting their well-being, and performance when they put their phone back into their pocket.

Literature Review

Present research surrounding thought speed has verified multiple forms of manipulation and a variety of responses to these manipulations. Recent experiments have identified a causal path between thought speed and mood. Pronin and Wegner (2006) induced participants to think fast or slow by having them read text from a computer monitor at either twice or half their normal reading speed, respectively. The participants were separated into a 2x2 design (thought speed X thought valence). Text from Velten's (1968) mood induction procedure was used, with participants reading a series of either increasingly elating or depressing statements. Participants showed independent effects of thought speed and thought content on mood: elating content induced more positive mood than depressing content and reading quickly induced more positive mood than reading slowly. The effect of the thought speed manipulation was at least as strong as the effect of content manipulation.

Pronin, Jacobs, and Wegner (2008) found that increased thought speed yielded greater positive affect than slowed thinking across a variety of manipulations. Participants across six experiments reported more positive affect from unrestrained idea generation than viable idea generation, fast idea exposure than slow idea exposure, freedom to plagiarize than inability to plagiarize, easy cognitive tasks than challenging cognitive tasks, narrating fast-forwarded video rather than normal or slowed video, fast reading than slow reading. Across all these conditions users in the manipulation designed to induce fast thought speed reported significantly higher perceived thought speed, and this perceived speed correlated strongly to feeling a greater positive affect.

Thinking fast also prompts other psychological responses. Chandler and Pronin (2012) found that participants with increased thought speed made riskier financial decisions and were

more likely to engage in risky behaviors like unprotected sex and illegal drug use. Participants who have been exposed to multiple ideas report higher self-esteem than their less informed counterparts (Pronin, Jacobs & Wegner, 2008). Manipulations of thought speed consistently enhance feelings of energy, and those induced to think quickly speak at a more energetic pace (Pronin, Jacobs & Wegner, 2008). Participants also report feeling more creative after being induced to think quickly (Pronin, Jacobs & Wegner, 2008; Pronin & Wegner, 2006).

The majority of behavioral research surrounding mobile phones and social media (online applications which facilitate the creation and sharing of content within a community) has focused on their ability to occupy cognitive resources, and their effects on our social behavior and mood (Slater, 2007). The vast majority of social networks are accessed via mobile phone, with 86% of Twitter usage coming from mobile in 2013 (comScore, Inc., 2014). Ward, Duke, Gneezy, and Bos (2017) find that the presence of one's smartphone decreases limited-capacity cognitive resources, with the costs highest for those with the greatest smartphone dependence.

This research has opened the door for a study on the effects of social media usage on thought speed, mood, activity enjoyment, and cognitive performance. No research, to our knowledge, focuses explicitly on a subtle yet critical element of social media—the ability to control the speed at which information is consumed. In this study, we seek to verify a causal relationship between the ability to control social media intake speed and increased thought speed, as well as measure thought speed's carry-over effects on subsequent activity enjoyment and cognitive performance.

Hypotheses

H1: The ability to Control Twitter Scrolling Speed Will Increase Thought Speed

Being able to scroll freely through Twitter will increase a participant's perceived thought speed.

H2: Participants Will Enjoy Tasks Which Induce Fast Thinking More

Inducing fast thinking will have carry-over effects into the participant's enjoyment of a subsequent event. Participants who are able to continue thinking quickly across two activities will report the highest enjoyment of the study.

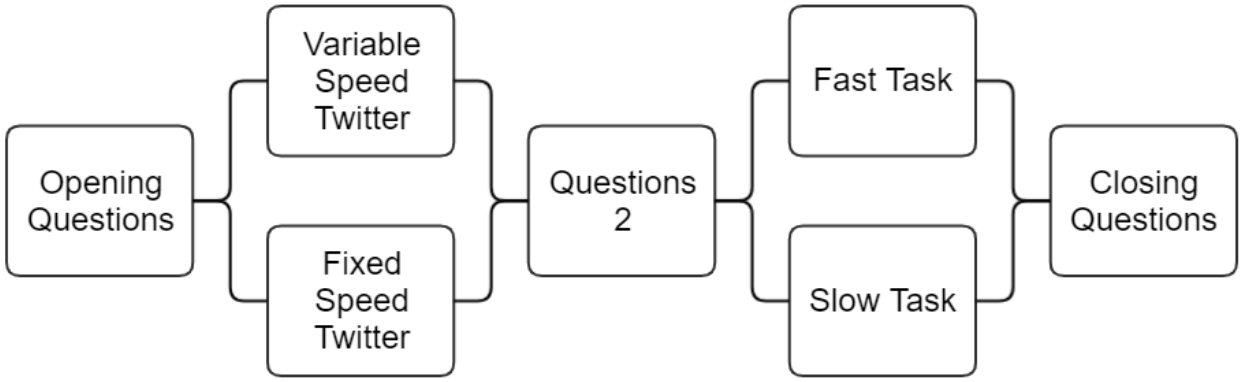
H3: Participants Induced to Think Quickly in The First Task Will Perform Better on The Task That Allows Them to Continue Thinking Quickly

Increased thought speed will have carry-over effects on a participant's performance on fast or slow thinking based cognitive performance test. Previously quick-thinking individuals will perform better on a test with a performance measure indicative of speed, while slow thinkers will perform better on a test designed to require deliberate thinking.

Methodology

Participants were separated into a two by two matrix of treatments designed to take them through a series of thought speed altering exercises (Scrolling Control X Cognitive Test).

Figure 1



Participants

247 undergraduate students from The Ohio State University participated in this experiment. Participants were run individually and were randomly be assigned to one of four possible conditions: variable scroll Twitter, fast word search, *n = 64*; variable scroll Twitter, slow word search, *n = 54*; fixed scroll Twitter, fast word search, *n = 53*; fixed scroll Twitter, slow word search, *n = 65*. Nine participants' data wasn't analyzed because they reported not trying on the word search task, and two other participants' data also wasn't considered because they exhibited much higher error rates on the word search than any other participants, leaving the total number of data points at 236.

Procedure

Upon arriving at the experimental session, participants provided written consent to participate in the study and seated at a computer. Their baseline mood was assessed through self-

evaluation on the Positive and Negative Effect Schedule (PANAS; Clark, Tellegen & Watson, 1988). They also rated their current perceived thought speed, excitement, enthusiasm, and happiness.

Content Manipulation 1

After completing the initial questions participants received one of the two following sets of instructions:

"On the next screen, you will be shown an example Twitter feed. Scroll through the Tweets and read them at your own pace. The activity will automatically end after 2 minutes, and you will be advanced to the next screen.

Click to the next screen when you are ready."

Or

"On the next screen, you will be shown a video of an example Twitter feed that scrolls automatically. Focus on the video and read each Tweet as it appears. The activity will automatically end after 2 minutes, and you will be advanced to the next screen.

Click to the next screen when you are ready. Once you get to the video on the next screen, press Play to begin."

Participants were shown the exact same simulated Twitter feed within their survey window. 43 tweets were selected consisting of a wide variety of interests and emotions. The participants in the first condition were able to freely scroll through the tweets at their own pace and read them as if they were truly on Twitter. In the second condition participants were shown

the same tweets in the same order, but in a video that scrolled through 11 tweets in two minutes. An image of the simulated Twitter feed is below.

Figure 2

Participants continued through the study. 117 participants answered the same set of earlier questions about their current perceived thought speed, excitement, enthusiasm, and happiness, as well as rating their enjoyment of the previous experience. Only about half of the participants randomly received this set of questions in an attempt to strengthen the carry-over effects of increased thought speed between activities.

Content Manipulation 2

Upon finishing the second set of questions they were again given one of two new sets of instructions:

“ On the next page, you will be highlighting words within a block of text, like how you practiced earlier.

*Select every word containing the letter **E** in the text.*
You will be scored based on the number of words with E's you select in a limited amount of time. Select as many of these words as you can!
Your score will be calculated based purely on the number of correct words you select within the time limit. ***Errors will not factor into your score, so don't worry about that!***
Select as many words with E's as possible as you can. Missed words will not count against you.

You will have one minute to complete the activity. The activity will automatically stop after one minute. Try to get as many words as you can!

Your timer will begin when you move onto the next page. Do so whenever you are ready. "

Or

" On the next page, you will be highlighting words within a block of text, like how you practiced earlier.

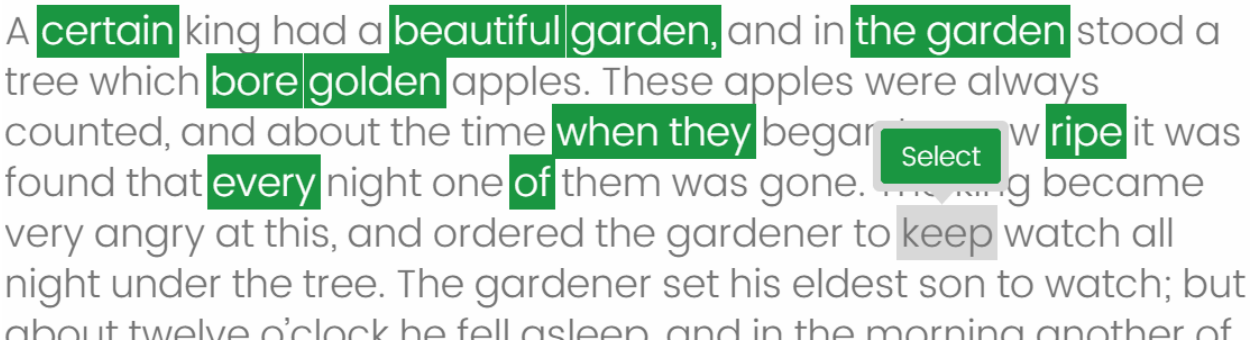
Select every word containing the letter I in the text. Select these words without skipping any!

Your score will be calculated based on the consecutive number of words you select that contain an I. In other words, your score will be the number of correct words that you get in a row. If you miss a word, or select an incorrect word your score will restart.
Be very careful to select all the words in order containing an I, and not mis-select any other words.

The activity will automatically stop after one minute. Try to get as many words as you can in a row, but make sure to not skip any and not make any mistakes! "

Participants were shown the exact same block of text from Grimm's Fairy Tales; the full text is available as Exhibit 1 in the appendix. In both conditions participants were forced to stay on the task page for 60 seconds. The performance measure for each task was exactly the one given in the instructions. The first condition was designed to induce fast, care-free thought and the second to induce slow, deliberate, and methodical thinking. An image of the task is shown below.

Figure 3



All participants were automatically moved on to the same final set of questions after 60 seconds. They were again asked to rate their current perceived thought speed, how much they currently felt excited, enthusiastic, and happy, and their enjoyment of the previous task. They were also asked to rate their enjoyment of the study, as a whole, and to what extent they tried to perform well on the word search task. Participants were then thanked, debriefed and dismissed.

Dependent Measures

Perceived Thought Speed

Participants rated their thought speed by responding to the question: “Sometimes people have the feeling that their thoughts are coming slowly, and other times people feel that their thoughts are ‘racing.’ What did you feel was the speed of your thoughts, as you were reading the statements in your Twitter feed?” The question was answered on a 9-point scale, anchored at 1 (very slow), 5 (moderate speed), and 9 (very fast). This method was used by Pronin and Wegner in their 2006 study (Pronin and Wegner, 2006).

Positive Mood

In the same experiment Pronin and Wegner assessed participants positive mood through three measures: how much they currently felt excited, enthusiastic, and happy (1 = very slightly, 3 = a little, 5 = moderately, 7 = quite a bit, 9 = extremely) (2006). The same method was used in this study. The prompts in this study were variations of: “How much do you currently feel excited?” Reliability for the summed items was high.

Enjoyment

Participants rated their enjoyment of each treatment and their overall experience on a 9-point scale (1=very unpleasant, 5=neutral, 9=very enjoyable).

Word Search: Total

This measure is the total number of words, correct or incorrect, selected by a participant in either word search task.

Word Search: Correct

This measure is the total number of correctly selected words, those containing either an ‘E’ or ‘I,’ in either word search task.

Word Search: Consecutive Correct

This measure is the longest chain of consecutive selected words without a misselection in either word search task.

Word Search: Errors

This measure is the total number of incorrectly selected words in either word search task.

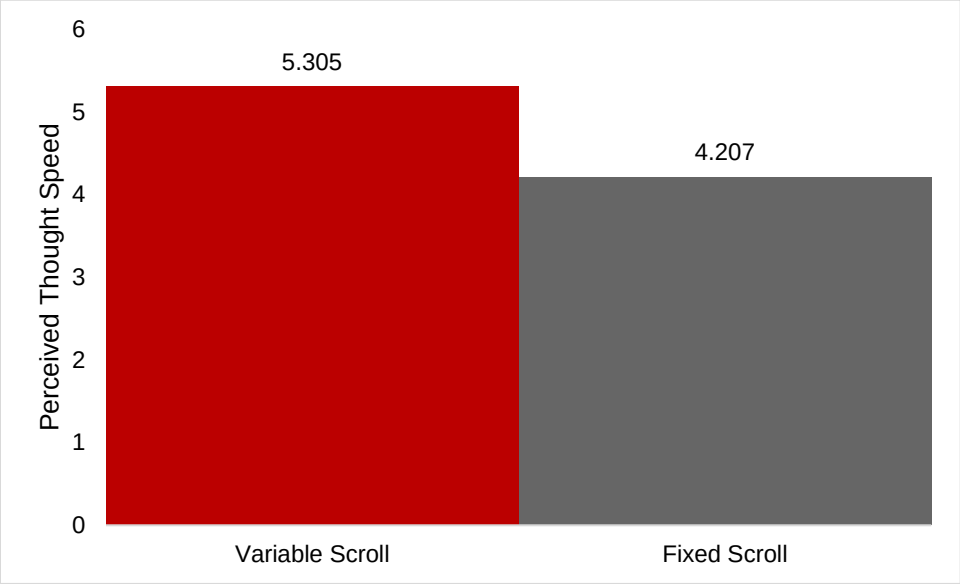
Data Analysis

We ran multiple independent t-tests to look for differences in measures between the 4 conditions. These included thought speed, positive affect, enjoyment and all word search performance measures. We also ran two-way ANOVA tests to measure interaction between variables across conditions and used Hayes' bootstrapping macro to see if thought speed mediated performance between conditions.

Results

Twitter Scrolling Control Manipulation Check

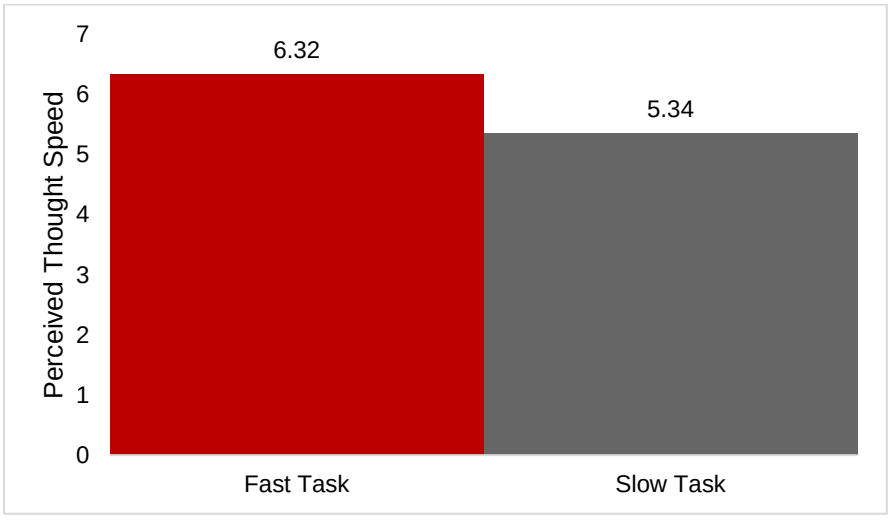
Figure 4



Participants able to control the speed at which they scrolled through the simulated Twitter feed reported significantly higher thought speed than those who were forced to read the tweets at fixed rate (Ms = 5.305 vs. 4.207, SDs = 1.5 and 1.98, t(115) = 3.385, p = .001).

Word Search Thought Speed Manipulation

Figure 5



Participants in the fast word search condition, with no consequences for error, reported significantly higher thought speed than those in the slow, deliberative condition (Ms = 6.32 vs. 5.34, SDs = 1.71 and 1.78, t(234) = 4.309, $p < .001$).

Insignificant Results Concerning Thought Speed

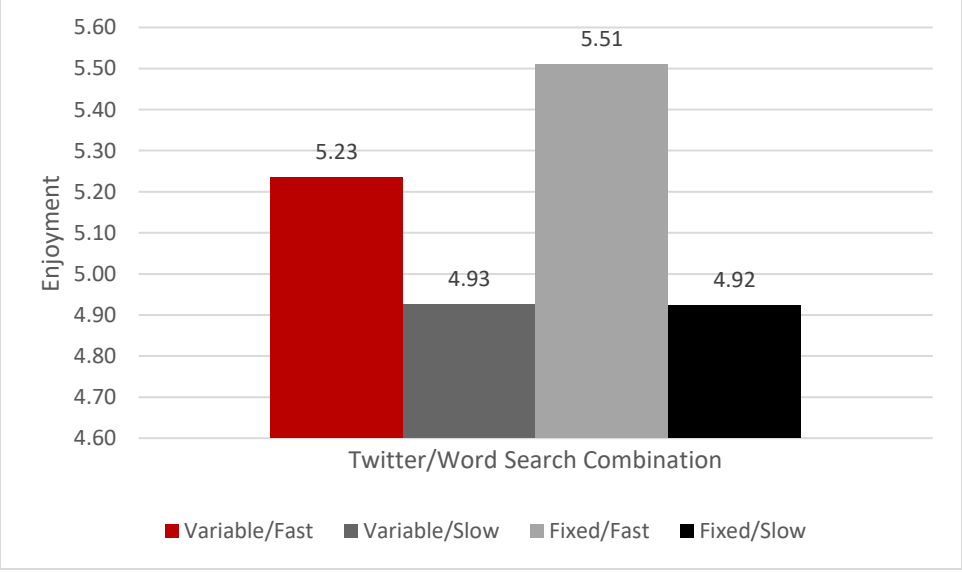
There was no significant interaction between a participant's experimental conditions on their thought speed at the end of the study.

Enjoyment of Twitter

Participants enjoyed freely scrolling through Twitter content significantly more than their counterparts who watched the same content at a fixed rate (Ms = 4.73 vs. 4.02, SDs = .224 and .274, t(115) = 2.012, $p = .047$).

Insignificant Results Concerning Enjoyment

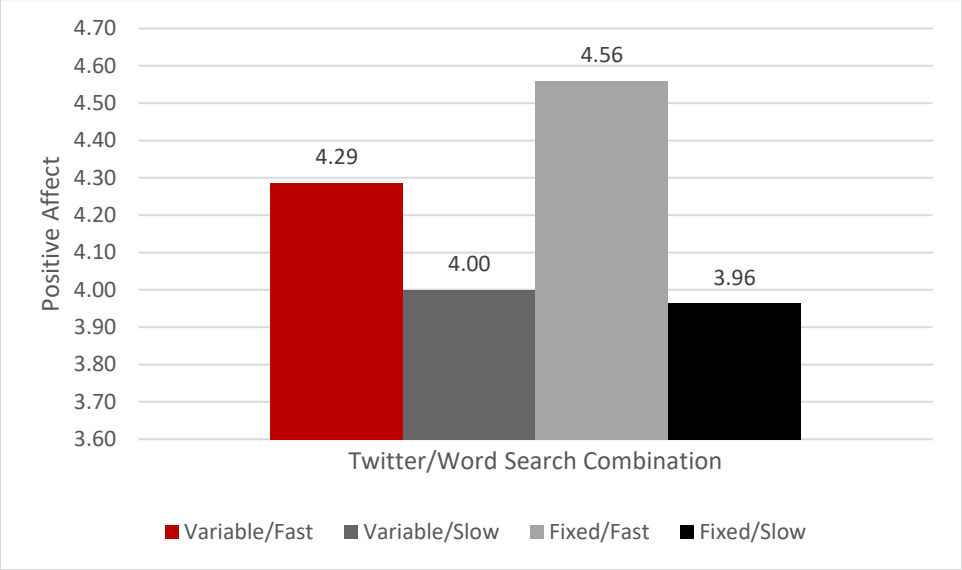
Figure 6



There was no significant interaction between the effects of a participant's Twitter condition or Task condition on their enjoyment of the study (F(1, 222) = .419, $p = .518$). A participant's word search condition also did not have a significant effect on their enjoyment.

Insignificant Results Concerning Mood

Figure 7

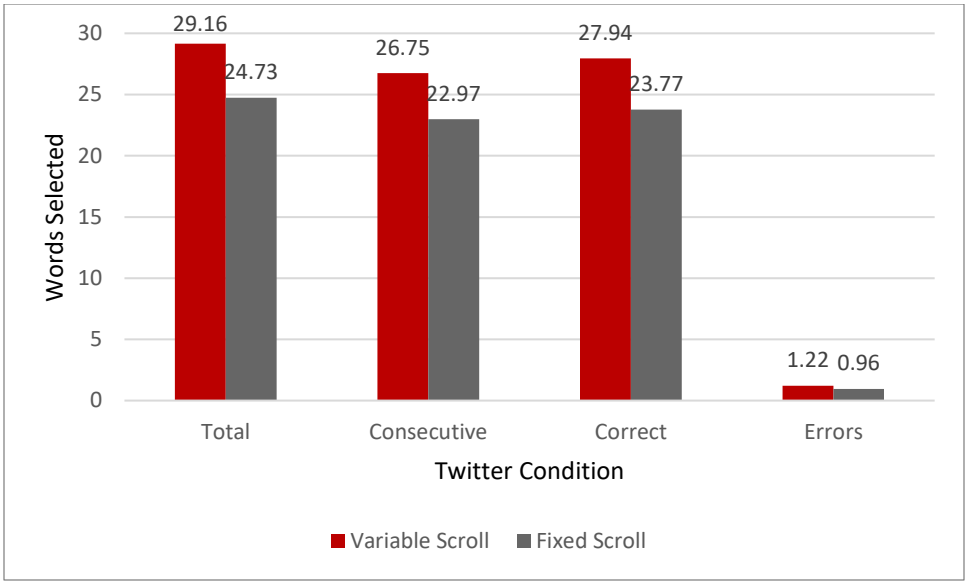


This experiment was not able to recreate thought speed's effects on positive mood. A participant's Twitter condition did not have a significant impact on their mood following their activity, whether it was measured with respect to the collected baseline or not. There was also not a significant difference in positive mood between task conditions, and no significant interaction.

Differences in Cognitive Performance by Word Search Condition

There were significant differences in total words selected (Ms = 28.70 vs. 25.22, SDs = 10.947 and 11.517, t(231) = 2.36, p = .019) and correct words selected (Ms = 27.77 vs. 23.97, SDs = 11.956 and 13.082, t(231) = 2.318, p = .021) between the two word search conditions, but the differences in errors and consecutive correct words were insignificant.

Differences in Cognitive Performance by Twitter Condition



Participants able to scrolly freely through Twitter content performed significantly on either variant of the word search task. They selected more words (Ms = 29.16 vs. 24.73, SDs = 11.409 and 10.896, t(231) = 3.036, p = .003), more correct words (Ms = 27.94 vs. 23.77, SDs = 12.936 and 12.072, t(231) = 2.544, p = .012), and longer chains of correct words (Ms = 26.75 vs. 22.97, SDs = 12.810 and 11.083, t(231) = 2.340, p = .020) while recording a similar number of errors.

Interactions Regarding Performance

There were no significant interactions between Twitter and word search conditions on any performance measure. Performance was not mediated by thought speed.

Summary of Results

Allowing users to control their scrolling speed proved to be a successful manipulation of thought speed. We did not see any interaction between conditions regarding enjoyment. Most interestingly, participants who controlled their scrolling speed in the first set of conditions performed better on nearly all performance measures in the word search task. They selected

more words, more correct words, longer chains of correct words, and posted a similar number of errors regardless of whether the task required speed or precision.

Discussion

A participant's ability to control the speed at which they browsed Twitter significantly impacted their perceived thought speed. This manipulation can now be extended for use in future studies. A connection between scrolling control and increased thought speed should signal a link between scrolling control on social media and heightened positive mood. This study was not able to verify that relationship, but future studies with larger sample sizes should be conducted. Splitting participants between the two word search conditions also proved to be a valid manipulation of thought speed, but participants did not experience any compounding effects across the conditions. The interaction between a participant's conditions on thought speed was negligible.

Our study found that there was no carry over of enjoyment between events. Participants able to scroll freely on Twitter enjoyed the activity more than those who read tweets at a fixed rate, but these individuals did not record even higher levels of enjoyment after being placed in the fast word search condition. A participant's word search condition did not significantly impact their enjoyment of the word search, so a link between thought speed and enjoyment could not be established. In other words, browsing social media is not affecting your enjoyment of the next activity you engage in, at least through thought speed.

No significant compounding effect of thought speed on performance was found as a result of this study. Participants who were able to control their scrolling speed on Twitter did not perform significantly better on the fast word search than those who watched the tweets at a fixed rate, and the same was found for the fixed scrolling and slow word search combination. Surprisingly, being able to control one's scrolling speed on Twitter did prime better performance across the board. Participants who were able to freely scroll on Twitter selected significantly

more words, more correct words, and longer chains of consecutively correct words during their word search, while recording an insignificant difference in errors. They performed better than those forced to scroll at a fixed rate regardless of whether the following task required speed or precision. Thus, we find that if you're taking a short break from work to consume some media, you should choose a media that lets you control your information intake, like Twitter. It will enhance thought speed and subsequent performance more than passive, fixed-speed media like watching television.

Implications/Future Research & Limitations

This study comes with limitations, as all others do. The age group of our participants was limited, and it is possible that different age groups choose to ingest content or browse social media at different rates. It would be worthwhile to run this experiment with multiple age groups. The mood of each tweet was not taken into account in this study, though previous research has shown that this likely wouldn't have had an effect on the results, it could be taken into account with future studies. The word search task was not fully successful at manipulating performance, its performance measures should be tweaked, or the task should be replaced in future studies. There were marginal differences in the variables that make up positive affect between Twitter conditions, it would be worthwhile to run this part of the experiment again with a larger sample size, as a significant difference might be seen.

Our experiment has opened the door for plenty of other future research. Scrolling control on Twitter can now be used as a manipulation of thought speed in other theoretical applications. This experiment should also be repurposed to measure if other scrolling control of other social media platforms has similar effects. It would also be interesting to study the affect of uncontrolled but varying content speed on participants thought speed. For example, the effects of alternating slow and fast speed content on a person's perceived thought speed, or those of faster but slowing content when compared to a slow fixed rate. It would also be worthwhile to measure the speed at which participants choose to scroll in the variable scroll condition to see if it is faster than the fixed rate scrolling, this would showcase that increased thought speed was purely the result of control, or if content speed was involved. This study allows for a wide variety of new research into how thought speed is priming us for different preferences and behaviors throughout the day, such as when we stop browsing social media. Browsing Twitter could prime individual's for certain types of music, behaviors such as multitasking or impatience, or any number of other

actions. Given thought speed's known effects on risk-taking this experiment also allows for studies into how social media may influence reckless driving, for instance if you browse Twitter at a stop light. Social media platforms have many effects on the well-being of their users, this study finds a positive one, and opens the door for others to be found.

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Appendix

Exhibit 1 – From: The Golden Bird, *Grimm's Fairy Tales*

A certain king had a beautiful garden, and in the garden stood a tree which bore golden apples. These apples were always counted, and about the time when they began to grow ripe it was found that every night one of them was gone. The king became very angry at this, and ordered the gardener to keep watch all night under the tree. The gardener set his eldest son to watch; but about twelve o'clock he fell asleep, and in the morning another of the apples was missing. Then the second son was ordered to watch; and at midnight he too fell asleep, and in the morning another apple was gone. Then the third son offered to keep watch; but the gardener at first would not let him, for fear some harm should come to him: however, at last he consented, and the young man laid himself under the tree to watch. As the clock struck twelve he heard a rustling noise in the air, and a bird came flying that was of pure gold; and as it was snapping at one of the apples with its beak, the gardener's son jumped up and shot an arrow at it.